U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Vulpes vulpes necator

Common Name:

Sierra Nevada Red fox

Lead region:

Region 8 (California/Nevada Region)

Information current as of:

10/19/2015

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

- ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
- ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
- ___ Range is no longer a U.S. territory
- ___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

___ Insufficient information exists on taxonomy, or biological vulnerability and threats, to support listing

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 04/27/2011

90-Day Positive:01/03/2012

12 Month Positive:10/08/2015

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, the majority our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements; meeting statutory deadlines for petition findings or listing determinations; emergency listing evaluations and determinations; and essential litigation-related administrative and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of Progress on Revising the Lists, in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**:State(s) information not available
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**:State(s) information not available
- **US Counties**:County information not available
- **Countries**:Country information not available

Land Ownership:

Federal (national forests and parks)

Lead Region Contact:

ASST REGL DIR-ECO SVCS, Daniel Russell, 916-414-6636, daniel_russell@fws.gov

Lead Field Office Contact:

Biological Information

Species Description:

Red foxes (Vulpes vulpes) are small, slender, doglike carnivores, with elongated snouts, pointed ears, and large bushy tails (USFWS 2015, p. 5). Diagnostic features, by which red foxes can be distinguished from other small canines, include black markings on the backs of their ears, black shins, and white tips on their tails. The fur of most red foxes is primarily yellowish to reddish brown. This is the “red” color phase. At least two additional color phases exist: the “cross” phase and the “black” phase. The cross phase is primarily grayish-brown, with darker lines along the back and shoulders, crossing behind the neck. The black phase (also called the silver phase) is primarily black, with occasional silver guard hairs.

Sierra Nevada red foxes average about 4.2 kg (9.3 lb) for males and 3.3 kg (7.3 lb) for females, as compared to the general North American average of about 5 kg (11 lb) for males and 4.3 kg (9.5 lb) for females. Sierra Nevada red fox adaptations to cold areas include a particularly thick and deep winter coat, and small toe pads (4 millimeters (mm) (0.2 inches (in)) across or less) that are completely covered in winter by dense fur to facilitate movement over snow. The Sierra Nevada red fox’s smaller size may also facilitate movement over snow by lowering weight supported per square centimeter of footpad (USFWS 2015, p. 6).

Taxonomy:

The Sierra Nevada red fox is one of several recognized North American red fox subspecies, and was originally considered a separate species when first identified in 1900 (USFWS 2015, p. 6). The Sierra Nevada red fox, along with two other western montane subspecies, is descended from "Nearctic" foxes that first colonized North America from Asia by crossing the Bering Land Bridge prior to the Illinoian glaciation, around 200,000 years ago or earlier (USFWS 2015, p. 7; Sacks 2014a, pp. 9–13). When the subsequent and most recent glacial period (the Wisconsinan) began about 100,000 years ago, those foxes established eastern and western populations south of the ice sheets in what would become the continental United States, while a group of "Holarctic" red foxes began a second migration across the land bridge from Asia to Alaska. As average temperatures warmed and the Wisconsinan glaciers retreated about 10,000 years ago, western populations of the Nearctic foxes retreated to cold, snowy habitats in the western mountains of the continental United States.

Habitat/Life History:

Sierra Nevada red foxes use multiple habitat types in the alpine and subalpine zones (near and above treeline) (USFWS 2015, p. 14). These include meadows, rocky areas, and high elevation conifer habitat of various types.

Like other red foxes in North America, the Sierra Nevada red fox appears to be an opportunistic predator and forager (USFWS 2015, p. 16). The Sierra Nevada DPS at Sonora Pass has a diet primarily composed of small rodents, but also likely including snowshoe hare (*Lepus americanus*) and white tailed jackrabbit (*Lepus townsendii*).

Although little direct information exists regarding Sierra Nevada red fox reproductive biology, there is no evidence to suggest it is markedly different from lowland dwelling North American red fox subspecies (USFWS 2015, p. 16). Those subspecies are predominately monogamous and mate over several weeks in the late winter and early spring. The gestation period for red fox is 51 to 53 days, with birth occurring from March through May in sheltered dens. Sierra Nevada red foxes use natural openings in rock piles at the base of cliffs and slopes as denning sites. They may possibly also dig earthen dens, similar to Cascade red foxes, though this has not been directly documented in the Sierra Nevada red fox (USFWS 2015, p. 17). Although researchers in the 1930s reported that Sierra Nevada red fox litters average six pups, with a range of three to nine, recent evidence suggests that litter sizes of two to three are more typical, and that reproductive output is generally low in montane foxes. Red fox pups in general are typically weaned by 8 to 10 weeks of age, begin exploring their parents' home range by 12 weeks (June through August), and disperse in the early fall when fully grown.

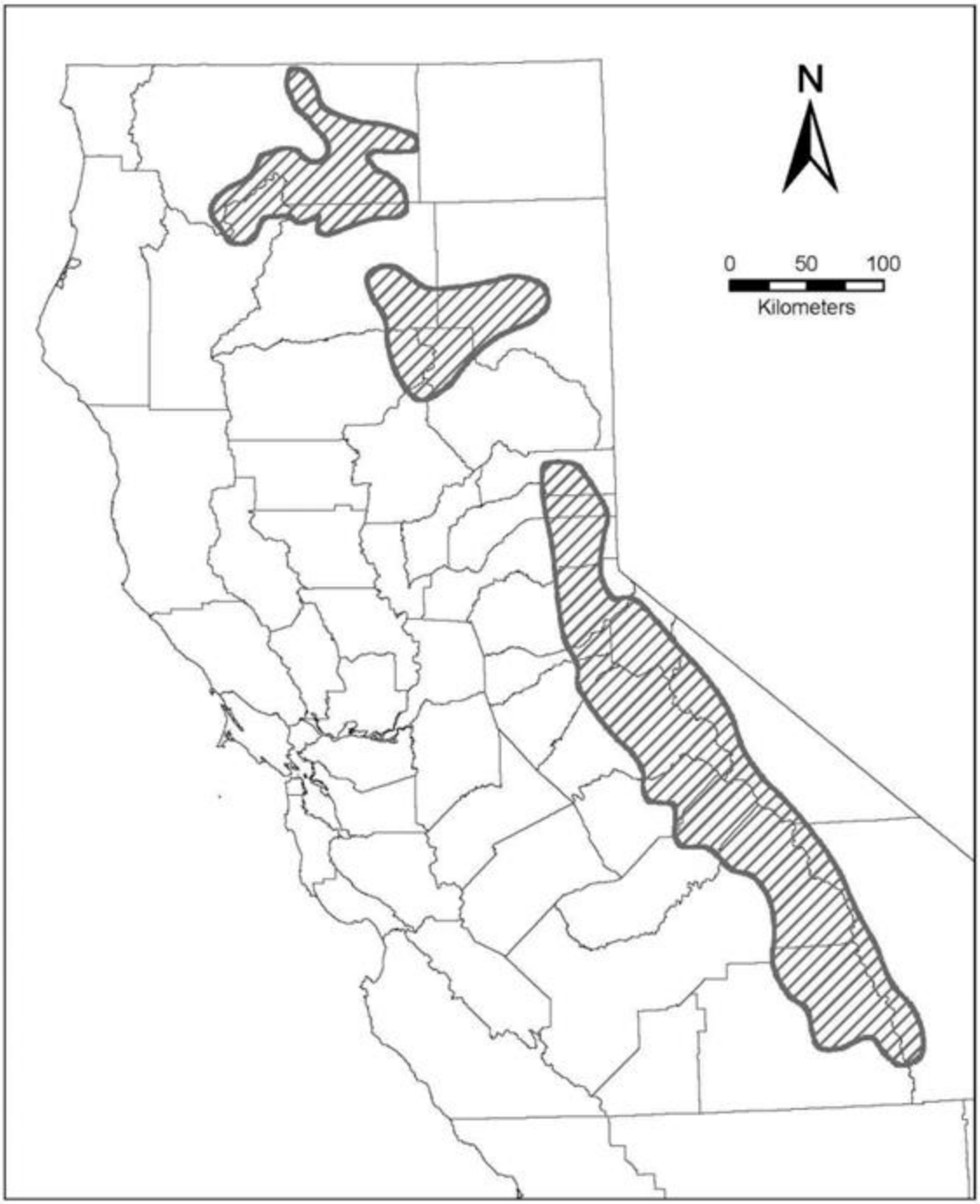
Dispersal distances have not been documented for the Sierra Nevada red fox, but one study found juvenile male red foxes in the American Midwest dispersed 30 km (18.6 mi) on average, while

juvenile females dispersed an average of 10 km (6.2 mi) (USFWS 2015, p. 17). A few young red foxes (5 percent) dispersed over 80 km (50 mi) in their first year (Id.). Home ranges for Sierra Nevada red foxes in the Sierra Nevada DPS averaged 910 ha (2,249 ac).

The average lifespan, age-specific mortality rates, sex ratios, and demographic structure of Sierra Nevada red fox populations are not known, and are not easily extrapolated from other red fox subspecies because heavy hunting and trapping pressure on those other subspecies likely skew the results (USFWS 2015, p. 17). However, a study conducted on the Sierra Nevada DPS found the average annual adult survival rate to be 82 percent, which is relatively high for red foxes.

Historical Range/Distribution:

The historical range of the Sierra Nevada DPS of the Sierra Nevada red fox extends along the upper elevations of the Sierra Nevada Mountain Range (above 1,200 m (3,937 ft)) from Tulare to Sierra Counties (see lower polygon in map, below) (USFWS 2015, pp. 8–9).



Current Range Distribution:

The DPS is currently only known from the general area surrounding Sonora Pass, including the northern portion of Yosemite National Park (USFWS 2015, p. 20). Researchers conducting a study in the area from 2011 through 2014 used genetic tests to identify eight SNRF. With the exception of a female killed on U.S. Highway 395, possibly while dispersing, all SNRF sightings were found within an area of 13,000 ha (32,124 ac), extending both north and south from California State Route 108, within 3 km of the Sierra Crest. This study area constituted 20 to 50 percent of the contiguous high quality habitat for SNRF in the region. The additional high quality habitat primarily extends south into the northern portion of Yosemite National Park, and is included in the area we have roughly defined as the Sonora Pass sighting area.

Population Estimates/Status:

Based on population density in studied portions (20 to 50 percent) of the overall area of contiguous high-quality habitat in the Sonora Pass area, the population has been estimated at 29 adults, including 14 breeders and 15 non-breeding helpers (USFWS 2015 pp. 13, 20). The researchers indicated the total might possibly be as high as 50 adults (20 breeders and 30 helpers). However, these estimates do not take into account the recent proliferation of non-native and hybrid foxes in the area (see Hybridization, under Threat Factor E, below), which are likely to occupy habitat assumed by the estimate to be occupied by Sierra Nevada red fox.

Distinct Population Segment(DPS):

The entity for which listing is warranted is a DPS (Sierra Nevada DPS of the Sierra Nevada red fox) (see our October 8, 2015 12-month finding for additional information (80 FR 60990). We have recognized one additional DPS: the Cascades DPS. That DPS includes all other Sierra Nevada red fox, which have been found in six sighting areas since the year 2000. One of these sighting areas is near Lassen National Park, in the California Cascades Mountains. The rest are at five locations in the Oregon Cascades Mountains, from the area of Crater Lake National Park to the area of Mount Hood.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Climate Change is likely to contribute to diminishment of snowpacks and to conversion of some forested areas to scrub or grassland due to drought-stress over the next 50 years (USFWS 2015, p. 46). The primary impact of such changes on the Sierra Nevada red fox is likely to result from increased use of high-elevation Sierra Nevada red fox habitat by coyotes, with associated increases in competition and predation risk (see “E. Other natural or manmade factors”, below) (USFWS 2015, p. 47).

B. Overutilization for commercial, recreational, scientific, or educational purposes:

We are not aware of any stressors of this type that constitute a population-level threat to the DPS.

C. Disease or predation:

Predation: Predation by coyotes is likely to rise over the next 50 years as snowpacks and forest cover decline due to climate change, allowing increased use of high-elevation habitat by coyotes (USFWS 2015, pp. 48–51). Coyotes chase and kill red foxes when presented with the opportunity, so red foxes tend to avoid areas frequented by coyotes. This (and competition with coyotes,

discussed below) may be important reasons why the range of Sierra Nevada red foxes is restricted to high-elevation areas where coyotes have historically been scarce, particularly during early spring months when red fox pups are born. Increased presence of coyotes in high-elevation habitat, particularly during early spring, is thus likely to also result in habitat avoidance and disruptions to hunting and reproductive success for Sierra Nevada red fox. Coyotes now outnumber Sierra Nevada red fox during summer months within the current range of the Sierra Nevada DPS (USFWS 2015, p. 50). Coyotes have also recently been documented residing in that current range year round, rather than leaving during winter months. Accordingly, predation impacts, and impacts from competition with coyotes (see below) are likely to increase over the next 50 years.

D. The inadequacy of existing regulatory mechanisms:

Existing regulatory mechanisms that affect the Sierra Nevada DPS include laws and regulations promulgated by the Federal Government and State of California governments (Factor D). These include the following mechanisms that are described in detail in the Species Report (Service 2015, pp. 58–63) and summarized in more detail above under the Existing Regulatory Mechanisms section for the entire taxon:
(1) Forest Service policy manual (USDA FS 2005, section 2670.22), which allows for designation of sensitive species of management concern, of which the Sierra Nevada red fox is a sensitive species where it occurs on National Forests in California (U.S. Forest Service Region 5).
(2) National Forest management is directed by the Multiple-Use Sustained- Yield Act of 1960, as amended (16 U.S.C. 528 et seq.), and the NFMA (16 U.S.C. 1600 et seq.). The NFMA specifies that the Forest Service must have an LRMP to guide and set standards for all natural resource management activities on each National Forest, including the Humboldt-Toiyabe and Stanislaus National Forests that currently harbor suitable habitat or known occurrences of Sierra Nevada red fox within the Sierra Nevada DPS. In addition, the Forest Service must implement management actions through their LRMPs that provide a conservation benefit to the DPS.
(3) The SNFPA requires fire and fuels management projects in most areas to retain at least 40 percent (preferably 50 percent) canopy cover within a treatment unit and effectively requires retention of trees 63.5 cm (25 in) dbh in most treated areas (USDA 2004, pp. 3, 50), which is close to the preferred winter habitat characteristics likely preferred by the subspecies. Additionally, SNFPA requires the Forest Service to: (a) Conduct an analysis to determine whether activities within 8 km (5 mi) of a verified Sierra Nevada red fox sighting have the potential to affect the species (USDA 2004, p. 54), (b) mandate a limited operating period of January 1 to June 30 as necessary to avoid adverse impacts to potential breeding, and (c) require 2 years of evaluations for activities near sightings that are not associated with a den site.
(4) The OPLMA (Pub. L. 111–11, p. 1059) established the Bridgeport Winter Recreation Area to control winter vehicles on Forest Service land, consisting of about 2,833 ha (7,000 ac) in the northern portion of the Sonora Pass sighting area (USDA 2010, p. 4). The OPLMA states that the winter use of snowmobiles is allowed in the Recreation Area, but is subject to terms and conditions, which can minimize potential impacts to sensitive resources. The Forest Service has completed a management plan that calls for monitoring of impacts to wildlife (USDA 2010, p. 9) and is proceeding with evaluations of impacts to Sierra Nevada red fox (see Vehicles, above).
(5) The National Park Service Organic Act of 1916, as amended (16 U.S.C. 1 et seq.) and the

National Park Service General Authorities Act of 1970 (16 U.S.C. 1a–1) address natural resources on National Park lands, specifically within Yosemite National Park within the Sierra Nevada DPS. These Acts require the National Park Service to ‘‘preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities’’ (USDI NPS 2006, p. 36). Yosemite National Park’s land management plan (USDI NPS 1980, pp. 10–11) does not contain specific measures to protect the Sierra Nevada red fox or its habitat, but does characterize the portion of the Park in the Sonora Pass sighting area as a ‘‘wilderness subzone,’’ wherein ‘‘natural systems and processes will be permitted to follow their minimum intrusion by man.’’

(6) The CESA (CFGC 2050 et seq.) prohibits possession, purchase, or ‘‘take’’ of endangered or threatened species without an incidental take permit issued by CDFW. The Sierra Nevada red fox was designated as a threatened species under CESA in 1980 (CDFW 2014, p. 12). In addition, the State of California classifies red foxes as a furbearing mammal that is protected from commercial harvest (14 C.C.R. 460).

Additionally, we note that the U.S. Marine Corps’ MWTC has lands within a portion of the Sonora Pass sighting area. The U.S. Marine Corps has initiated preparation of an INRMP (Norquist 2014, p. 2) consistent with requirements outlined in the Sikes Act (16 U.S.C. 670a), which would address potential impacts to natural resources, presumably to include the Sierra Nevada red fox. Because an INRMP is not yet finalized, we cannot evaluate its adequacy as a regulatory mechanism.

Overall, existing regulatory mechanisms currently (and into the future) provide substantial protection on Federal lands for the Sierra Nevada DPS. Within the Sonora Pass sighting area specifically, the Sierra Nevada red fox’s State-listed status and protection from commercial harvest provide additional significant protection for the long-term conservation of the subspecies.

E. Other natural or manmade factors affecting its continued existence:

Competition from coyotes: Both coyotes and Sierra Nevada red foxes are opportunistic predators with considerable overlap in food consumed (USFWS 2015, p. 48). Red foxes thus likely avoid areas frequented by coyotes for reasons involving both competition and predation avoidance. Impacts of such avoidance are as discussed for predation by coyotes under Factor C, above. We considered competition and predation from coyotes as a single threat when determining it would likely have a population-level impact within 50 years.

Small isolated population: The Sierra Nevada DPS has been estimated to consist of approximately 14 breeding pairs and 15 non-breeding adults (USFWS 2015, p. 13). That estimate was based on extrapolations of fox counts in a study area consisting of 20 to 50 percent of habitat likely to be occupied (Quinn and Sacks 2014, pp. 10, 14), and does not appear to take into account subsequent drops in Sierra Nevada red fox numbers in the study area due to hybridization (see below).

Small, genetically isolated populations such as the Sierra Nevada DPS are subject to two types of threats: they are more vulnerable to deleterious chance events such as serious fires or local disease outbreaks; and they are vulnerable to inbreeding depression (USFWS 2015, p. 38). Losses of relatively few individuals due to deleterious chance events tends to produce proportionately

greater impacts on small populations simply because such populations have fewer individuals to lose (USFWS 2015, p. 38).

Inbreeding depression occurs in small isolated populations because genetic diversity is lost as the population shrinks, resulting in recessive deleterious versions of some genes being left by chance as the only remaining versions of those genes in the population (USFWS 2015, pp. 38–39). Inbreeding depression can result in lowered reproductive success, congenital abnormalities, and increased susceptibility to disease in full-blooded members of the population (Sacks et al. 2015, pp. 15–16; USFWS 2015, p. 39). Such effects would not be expected in first generation hybrids, however, because the recessive deleterious gene-variants would be masked by dominant gene variants from the nonnative parent. A three-year study of the Sierra Nevada DPS documented no successful reproduction between DPS members, but found extensive successful reproduction between DPS members and non-native red fox immigrants (see Hybridization, below). This low reproductive success within the population, but not with individuals from outside the population, constitutes evidence that the DPS may be affected by inbreeding depression (Sacks et al. 2015, p. 16).

Hybridization: Hybridization with non-SNRF red foxes can lead to outbreeding depression or to genetic swamping (USFWS 2015, p. 42). Outbreeding depression produces a decrease in survivorship or reproduction due to the loss of locally adapted gene variants or the breakup of coadapted gene complexes. Genetic swamping occurs when continued influx of outside gene-variants causes the replacement of most native variants, effectively turning what was once a native population into a population of some other subspecies or species.

In 2012, two male nonnative red foxes with fur-farm ancestry immigrated into the current range of the Sierra Nevada DPS and mated with native Sierra Nevada red fox (USFWS 2015, pp. 20, 21). By 2014 they had fathered at least 11 surviving pups, one of which was a 75 percent nonnative resulting from the mating of one of nonnative male with one of the hybrids (Sacks et al. 2015, pp. 17, 29). These 11 hybrid pups were the only pups known to be produced by the DPS. Over the same time period, the number of genetically identified non-hybrid DPS members fell from six to two. A third nonnative male red fox was also identified in the area in 2014, but was not known at that time to have sired any pups.

Conservation Measures Planned or Implemented :

The U.S. Forest Service has identified the Sierra Nevada red fox as a sensitive species in California, where the Sierra Nevada DPS is located (USFWS 2015, p. 63). This requires the Forest Service in California to analyze its activities for their potential effects on the Sierra Nevada red fox. It has also resulted in funding for studies, such as the one that documented the ongoing hybridization.

A “Sierra Nevada Red Fox Working Group” has formed to help monitor the fox’s status and plan conservation and research efforts. Members of the working group include the U.S. Forest Service, the U.S. Fish and Wildlife Service, the U.S. National Park Service, California Department of Fish

and Wildlife, the University of California, and others (Sierra Nevada Red Fox Working Group 2015, p. 1).

The Sierra Nevada red fox is also protected from hunting and trapping by California fish and game laws, and from any manner of "take" by its status as a "threatened species" under the California Endangered Species Act (CESA). CESA also prohibits possession, sale, purchase, or export of SNRF parts or products, such as pelts.

Summary of Threats :

The Sierra Nevada DPS of the Sierra Nevada red fox is threatened at a population-level within the foreseeable future (50 years) by:

1. Climate change, and accompanying increases in predation and competition from coyotes;
2. Small population size (under 50 adults), and accompanying risks from inbreeding depression and chance deleterious events; and
3. Hybridization, and accompanying risks from genetic swamping and outbreeding depression.

The most serious current threats appear to be a complete lack of evidence of native pup production, possibly resulting from inbreeding depression; and the production in 2012 and 2013 of 11 hybrid pups, potentially leading to genetic swamping. Information on pup production for 2015 is not available.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

Fund continuing studies to track pup production and coyote interactions.
Fund additional conservation measures as recommended by the Sierra Nevada Red Fox Working Group

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	2
		Subspecies/Population	**3**
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

Because the population is so small (less than 50 adults), it could be extirpated by any of the population-level threats discussed above.

Imminence :

Threats from low reproductive success within the DPS (presumably from inbreeding depression) and from hybridization are imminent. Together these effects have transformed the known composition of red foxes in the current range of the DPS from entirely Sierra Nevada red fox to primarily hybrids over the course of two years (2013 to 2014). Preliminary data for 2015 shows this trend is still ongoing (Sacks 2016, p. 1).

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

Description of Monitoring:

Monitoring of foxes near Sonora Pass, CA is ongoing using genetic testing of hair and scat. Camera traps in northern, high-elevation areas of Yosemite National Park have produced six

pictures of one or more red foxes, that are presumed to be Sierra Nevada red foxes. Monitoring with camera traps is ongoing, and hair snares for genetic analyses have been added to the camera stations (Stock 2016, p. 1).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

none

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

Both the California Department of Fish and Wildlife and the Oregon Department of Fish and Wildlife provided information and comments.

Literature Cited:

Quinn C, Sacks B. 2014, May 6. Ecology distribution and genetics of Sierra Nevada red fox. Report to the California Dept. of Fish and Game. 38 pp.

Sacks B. 2016, April 21. New Sierra Nevada red fox information for the CNOR. Email to Glen Tarr, USFWS. 2 pp.

Sacks BN, Quinn CB, Alden PB. 2015 April 21. Sierra Nevada red fox monitoring: phase 1. Report to the US Forest Service, Pacific Southwest Region. Agreement No. 12CS11052007021. 37 pp.

Sierra Nevada Red Fox Working Group. 2015, Oct 28. Meeting Notes. Available from Sacramento Fish and Wildlife Office. 17 pp.

Stock S. 2016, April 29. Sierra Nevada red fox information request. Email to Glen Tarr, USFWS. 2 pp.

[USFWS] United States Fish and Wildlife Service. 2015, Aug 14. Species Report, Sierra Nevada red fox (Vulpes vulpes necator). Available from http://www.fws.gov/sacramento/outreach/2015/10-07/docs/20150814_SNRF_SpeciesReport.pdf and at the Sacramento Fish and Wildlife Office. 78 pp.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The

Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 

06/29/2016
Date

Concur: 

11/14/2016
Date

Did not concur: _____

_____
Date

Director's Remarks: